

THE MINERAL INDUSTRY OF TURKEY

By Philip M. Mobbs

Turkey had a diverse and dynamic mineral industry. The nation was a leading producer of barite, boron minerals, celestite (strontium), chromite, emery, feldspar, limestone, magnesite, marble, perlite, and pumice, and was a significant source of value-added processed mineral commodities that included refined borates and related chemicals, cement, ceramics, glass, and steel.

Turkey was positioned as a significant channel for trade between Europe and the countries in the eastern Commonwealth of Independent States (CIS) and has remained a conduit for trade with the Middle East. During the past 10 years, the value of Turkish exports has more than tripled and that of imports has more than doubled. Bridging Asia and Europe, Turkey also has emerged as a major energy transit corridor. Crude oil from Iraq moved through Turkey until March, when the war in Iraq stopped Iraqi oil exports. Natural gas from Iran and Russia was piped into Turkey and the proposed South Caucasus gas pipeline was to deliver additional natural gas to Turkey from Azerbaijan, some of which was to be transshipped to Greece under a December 2003 agreement to build a 285-kilometer (km) pipeline by 2006 and to deliver about 14.2 million cubic meters per year of Azerbaijani natural gas to Greece. Connection of the Turkish natural gas pipeline system with the European gas network could provide an alternative route to allow surplus Eurasian natural gas to flow into Europe (Alexander's Gas & Oil Connections, 2003¹).

Turkey's gross domestic product (GDP) based on purchasing power parity was estimated to be about \$461 billion in 2003, and GDP per capita based on purchasing power parity was \$6,646. The national economy continued its recovery from the severe economic crisis of 2001. While real GDP growth slowed in 2003 to 5.8% compared to a revised 7.9% in 2002, the inflation declined to an annual rate of 25%, which was a decrease from 45% in 2002 and 85% in 1998. In 2003, the Government worked closely with the International Monetary Fund (2004§) to continue economic reforms and with the European Union to become a member.

Trade

In 2003, total Turkish exports were valued at \$47.2 billion compared with \$35.8 billion in 2002 and \$15.3 billion in 1993. European countries received 60% of Turkish exports (by value) in 2003 compared with 56% in 1993. Countries of the Middle East received 11% of Turkish exports in 2003, which was a decrease from 14% in 1993, and countries of the CIS received 6%, which was a decrease from 7% in 1993. The United States received 8% of Turkish exports in 2003, which was an increase from 6% in 1993 (State Institute of Statistics, 2004§).

Total imports were valued at \$69.3 billion in 2003 compared with \$51.3 billion in 2002 and \$29.4 billion in 1993. In 2003, Europe accounted for 56% of total Turkish imports (by value), which was an increase from 53% in 1993. The Middle East was the source of 6% of Turkish imports compared with 10% in 1993, and the CIS supplied 11% of imports, which was an increase from 8% in 1993. The United States supplied 5% of Turkish imports in 2003, which was a decrease from 11% in 1993 when the United States was a significant supplier of steel scrap to the Turkish steel industry (State Institute of Statistics, 2004§).

In 2003, exports of mineral and chemical-based commodities and products were valued at about \$10.7 billion and accounted for about 22% of total Turkish exports. Iron and steel exports, which included bars, billets, pipes, pig iron, flat-rolled products, sections, and wire, were valued at about \$4.4 billion. Other exports included mineral fuels, oils, and products, \$968 million; jewelry, about \$788 million; raw blocks and worked stone, \$431 million; copper metal, \$248 million; inorganic chemicals, \$245 million; borates and concentrates, about \$84 million; and metal ores, about \$56 million. Compared with exports in 2002, the value of steel wire bars increased by 38% in 2003 to \$1.2 billion; aluminum bars, pipes, profiles, ropes, wire and unrolled aluminum exports, by 44% to \$309 million; worked marble, by 39% to \$302 million; cold-rolled flat steel, by 42% to \$175 million; copper ropes and wires, by 32% to \$164 million; granite blocks, by 66% to \$97 million; steel scrap, by 88% to \$38 million; lead ore, by 36% to \$28 million; steel wire, by 47% to \$19 million; feldspar, by 110% to \$10 million; slate, by 65% to about \$4 million; marble blocks, by 642% to \$3 million; meerschaum, by 1,884% to \$2 million; bauxite, by 37% to \$2 million; and antimony ore, by 69% to about \$2 million. In 2003, the value of exports of hot-rolled steel dropped by 9% to \$107 million, fertilizer, by 45% to \$20 million; and pig iron, by 75% to less than \$1 million (Istanbul Mineral and Metals Exporters' Association, 2004§).

Structure of the Mineral Industry

The private sector dominated the country's industrial minerals and metals sectors. Private-sector enterprises included exploration and production companies owned by domestic and foreign stockholders, mining and manufacturing subsidiaries of large Turkish conglomerates, and medium- and small-sized family-owned mining companies. In 2003, 32,259 new companies and cooperatives were established in Turkey, of which 291 were mining and quarrying companies.

The Government had started to privatize state-owned companies in 1989; state-owned companies, however, remained significant producers of fuels and metallic ores. In 2003, mineral operations held by the Government's Privatization Administration included the chrome mines and ferrochrome and ferrosilicon plants of Eti Elektrometalurji A.Ş.; the ferrochrome plant of Eti Krom A.Ş.; the copper

¹References that include a section mark (§) are found in the Internet References Cited section.

mines of Eti Bakir A.Ş.; the copper smelter of Karadeniz Bakir İşletmeleri A.Ş.; several fertilizer plants; the iron ore mines of Divriği Hekimhan Madenleri Sanayi ve Ticaret A.Ş.; the domestic and foreign steel operations of Ereğli Demir ve Çelik Fabrikaları T.A.Ş. (Erdemir); the petroleum refineries of Türkiye Petrol Rafineleri A.Ş. (TUPRAS); and the silver mine and plant of Eti Gümüş A.Ş. The slowdown in the Government's divestment of state-owned mineral enterprises that began with the economic crisis in late 2001 continued through 2003, although much of the Privatization Administration's mineral company portfolio was expected to be sold off in 2004.

Commodity Review

Metals

Copper.—Çayeli Bakir İşletmeleri A.Ş. (CBI), which was the joint venture of Inmet Mining Corp. (55% equity interest) and Eti Holdings A.Ş. (45%), continued the restoration of the Cayeli Mine after a series of ground falls in 2002. Production increased to 930,000 metric tons (t) of ore milled, which contained 33,500 t of copper and 33,600 t of zinc. In 2003, CBI started a 3-year \$14 million program to deepen the mine's main shaft by 300 meters (m). CBI also acquired Teck Cominco Madencilik Sanayi A.Ş. and its Cerattepe and Rize exploration licenses. CBI proposed to start production at Cerattepe by 2006 and to transport mined ore 200 km to the mill at the Cayeli Mine by truck (Inmet Mining Corp., 2004, p. 16-17, 20).

In 2003, Anatolia Minerals Development Ltd. and Rio Tinto Mining & Exploration Ltd. extended their strategic exploration agreement until 2008. In 2003, the companies continued exploration on the Girculer, İkiztepe, and Karapınar copper prospects and drilled the Kızılviran copper prospect. Eurasian Minerals Inc. (which was known as Marchwell Capital Corp. prior to its acquisition of Southern European Exploration Ltd. in 2003) sampled the Golcuk property.

Ferrochromium.—Improved international market conditions in 2003 allowed Eti Krom to restart two of its four high-carbon ferrochromium furnaces that had been idle since 2001.

Gold.—In past years, until Normandy Madencilik A.Ş. opened the Ovacık gold mine in 2001, Turkish gold output was primarily a coproduct of base-metal mine production. In 2002, Newmont Mining Corp. of the United States acquired Normandy Mining Ltd. of Australia and its subsidiary Normandy Madencilik. Newmont increased ore production in 2003 by almost 40% compared with that of 2002.

Eldorado Gold Corp. continued exploration of the Kisladağ prospect, Eurasian Minerals was prospecting on the Delidemirci and the Sisorta gold properties, and Odyssey Resources Ltd. started exploration on the Tavsan property. Rio Tinto continued to drill the Cöpler gold prospect for the Anatolia/Rio Tinto joint venture. At yearend, Anatolia Minerals was negotiating to buy the remaining equity interest (about 25%) that it did not own in the Cöpler prospect from Rio Tinto and the Turkish license holder.

Iron and Steel.—The Turkish steel industry was dominated by electric-arc-furnace (EAF) mini-mills that required steel scrap. More than 70% of domestic steel production capacity was attributed to EAF plants. Because of the higher prices for scrap on the international market in 2003 compared with those of 2002, obtaining steel scrap was a problem for Turkish mini-mills. Turkey, formerly a major importer of scrap from the United States, obtained about 50% of its scrap supply from the Ukraine (Metal Bulletin, 2003).

Steel output was skewed toward long products (bars, billets, concrete-reinforcing bar, and wire rod), which accounted for about 80% of output, compared with flat products (18%) and specialty steel (2%). In 2002, Erdemir had completed its acquisition of Iskenderun Demir ve Çelik A.Ş. (İsdemir). In 2003, Erdemir proposed to convert the İsdemir steel plant from long-product to flat-rolled steel production because Erdemir was the only flat-product producer in Turkey and was unable to satisfy local demand for flat products (Woodcock and Burtin, 2003).

Nickel.—European Nickel plc of the United Kingdom continued its evaluation of the Caldag lateritic nickel deposit near İzmir. In 2002, European Nickel and As Krom Madencilik Turizm Lusaat Nakliye San. ve Tic. A.Ş. of Turkey had set up Bosphorus Nickel Madencilik Turizm A.Ş. as the operating company for Caldag. Bosphorus Nickel started trial mining in April 2003, and total production for the year was about 44,000 t of ore. Two shipments of about 20,000 t of ore were sent to the Larco nickel smelter in Greece, which was operated by General Mining and Metallurgical Company S.A. Larco. European Nickel reported that the ore shipments averaged 1.38% nickel (Canaccord Capital Ltd., 2004, p. 30).

Oriel Resources plc of the United Kingdom explored the Gordes nickel prospect, which was located about 60 km south of Caldag. In October, Oriel shipped 3,500 t of ore that graded 1.37% nickel to Larco for treatment. At yearend, Oriel was preparing a second shipment of ore (Oriel Resources plc, 2004, p. 42).

Industrial Minerals

Boron.—Unlike most of state-owned Eti Holding A.Ş.'s mining operations, the boron mines were not transferred to the Privatization Administration. Turkish boron operations had been nationalized in 1978 and the Government company had retained a monopoly on boron production. In 1985, private companies were authorized to export boron.

In 2003, the 240,000-metric-ton-per-year (t/yr)-capacity Bandırma sulfuric acid plant and the 100,000-t/yr-capacity Bigadic II boron grinding unit were under construction. Construction of the 100,000-t/yr-capacity Emet boric acid plant was completed. The state geological research organization Maden Tetkik ve Arama Genel Müdürlüğü (MTA) explored and mapped several boron prospects near existing Eti Bor mines. Eti Holdings reported that MTA completed a 6,956-m drill program and calculated that Eti Bor

controlled an additional 1 billion metric tons of boron reserves. Eti Holding's organization name was to be changed to Eti Maden İşletmeleri Genel Müdürlüğü in January 2004 (Eti Holding A.Ş., 2004§).

Feldspar.—Several companies completed new facility projects in 2003, which allowed increased production and sales of feldspar. Cine Akmaden Madencilik T.A.Ş. tripled its feldspar-crushing capacity with the installation of a new 300-metric-ton-per-hour plant and initiated an expansion of the company's flotation capacity to 180,000 t/yr. Esan Eczacıbaşı Endüstriyel Hammaddeler San.ve Tic. A.Ş. continued the construction of a 400,000-t/yr-capacity crushing plant. Commercial operations were expected to begin in 2004. In August, operations began at the 150,000-t/yr flotation plant that Kaltun Madencilik San. ve Tic. A.Ş built at Kaltun (Moore, 2004).

Soda Ash.—Eti Soda A. Ş., which was a venture of the Park Group (73.96% equity interest), Eti Holdings (26%), and Türkiye Vakıflar Bankası T.A.O. (0.04%), continued construction of the Beypazari trona processing plant. Commercial production was expected to begin in 2006.

Mineral Fuels

Natural Gas and Petroleum.—State-owned Türkiye Petrolleri A.O. was the country's leading oil producer. Most of Turkey's oil exploration and production were in the southeastern region; exploration activity on the recently-awarded Black Sea hydrocarbon leases, however, was expected to increase in 2004. In 2003, acquisition of two-dimensional and three-dimensional seismic survey data significantly increased compared with that of 2002. New wells added to gas production from the Cayirdere gasfield and to oil production from the G. Raman, Tokaris, and Vakıflar oilfields.

In November, BP p.l.c. indicated that it planned to close the 100,000-barrel-per-day Anadolu Tasfiyehanesi A.Ş. refinery. In December 2003, law No. 5015, the Petroleum Market Law, was enacted (Platts, 2003§).

Bad weather and increased ship traffic again raised the issue of shipping crude oil through the Bosphorus and the Dardanelles straits. In 2003, 8,097 tankers that carried 130 million metric tons (Mt) of cargo transited the straits compared with 6,516 ships that carried 101 Mt in 2001. Turkish regulations allow only tankers longer than 200 m to transit the passage during daylight hours. In early December, tankers that were moving crude oil from Russia to Europe were delayed for up to 30 days when seeking passage through the Bosphorus. At yearend, a new vehicle-tracking system became operational. OJSC AK Transneft of Russia proposed to build an oil pipeline across Turkey or across Bulgaria and Greece to bypass the bottleneck (Oil & Gas Journal, 2004; Roberts, 2004§).

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Major Sources of Information

General Directorate of Mineral Research and Exploration
06520 Ankara, Turkey
Telephone: +(90) (312) 287-34-30
Fax: +(90) (312) 287-91-88
Internet: <http://www.mta.gov.tr>

General Directorate of Petroleum Works
Ziya Gökalp Cad. No. 41 Poyraz Han
06420 Yenışehir
Ankara, Turkey
Telephone: +(90) (312) 435-51-45
Fax: +(90) (312) 435-23-64
Internet: <http://www.pigm.gov.tr>

Istanbul Mineral and Metals Exporters' Association
Dış Ticaret Kompleksi A-bloc Çobançeşme Mevkii
Sanayi Cad. Yenibosna-Bahçelievler
Istanbul, Turkey
Telephone: +(90) (212) 454-00-00
Fax: +(90) (212) 454-00-01
Internet: <http://www.immib.org.tr>

State Institute of Statistics
06100 Necatibey Cad. 114
Ankara, Turkey
Telephone: +(90) (312) 425-8442
Fax: +(90) (312) 417-0432
Internet: <http://www.die.gov.tr>

Turkish Ministry of Energy and Natural Resources
İnönü Bulvarı, No. 27 Bahçelievler
Ankara, Turkey
Telephone: +(90) (312) 212-69-15
Fax: +(90) (312) 286-47-69
Internet: <http://www.enerji.gov.tr>

TABLE 1
TURKEY: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	1999	2000	2001	2002	2003 ^p
METALS					
Aluminum:					
Bauxite ²	207,743	458,537	242,040	287,403	364,306
Alumina:					
Gross weight	159,122	155,448	145,993	152,869	162,174
Metal, smelter ^c	62,000	61,000	61,730 ³	63,000	63,000
Antimony: ^c					
Ore, mine output:					
Gross weight	3,400	6,800	7,000	7,000	7,000
Sb content	180	360	370	370	370
Concentrates:					
Gross weight	500	1,000	1,000	1,000	1,000
Sb content	100	200	200	200	200
Cadmium	64	--	--	--	--
Chromium, gross weight (34% to 43% chromic oxide) ⁴	770,352	545,725	389,759	313,637	281,783
Copper:					
Mine output, exclusive of pyrite: ⁵					
Gross weight	4,297,170	4,473,711	3,467,306	2,942,721	2,620,896
Cu content of ore	73,051	76,053	56,864	48,253	45,000
Metal:					
Smelter output, primary and secondary	32,900 ^e	32,550	33,504	32,550	30,000
Refined ^c	60,500	64,100	58,400	41,000	45,000
Gold ^{e, 6} kilograms	1,200	500	2,000	2,400 ^r	2,350
Iron and steel:					
Iron ore:					
Gross weight thousand metric tons	4,846	4,076	3,932	4,500 ^e	4,000
Fe content ^c do.	2,600 ^r	2,200	2,100	2,400	2,100
Metal:					
Pig iron and ferroalloys:					
Ferchromium	99,100	97,240	50,735	11,200	25,000
Ferrosilicon	420	--	5,895	7,245	7,000
Pig iron	314,670	300,000 ^e	247,598	157,622	181,080
Steel, crude including castings thousand metric tons	14,309	14,325	14,382	16,046	17,644
Lead:					
Mine output, Pb and Pb-Zn ores:					
Gross weight	284,504	345,391	388,795	375,592	379,250
Pb content	14,225	17,270	17,923	17,352	17,500
Concentrates: ^c					
Gross weight	11,500	13,000	13,000	13,000	13,000
Pb content	7,500	8,500	8,500	8,500	8,500
Metal, refined ^c	4,000	4,000	4,000	4,000	6,000
Manganese ore, gross weight ⁷	29,000	23,300	20,000	20,000	18,000
Silver, mine output, Ag content ⁸ kilograms	100,000 ^e	110,000 ^e	987,656	662,000	794,998
Zinc:					
Mine output, Zn and Pb-Zn ore:					
Gross weight	4,630	861	816	800	800
Zn content	545	39	37	35	34
Concentrates: ^c					
Gross weight	500	26	25	25	25
Zn content	300	26	25	25	25
Metal, smelter, primary	33,179	--	--	--	--

See footnotes at end of table.

TABLE 1--Continued
TURKEY: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity	1999	2000	2001	2002	2003 ^p
INDUSTRIAL MINERALS					
Aluminum sulfate, alunite	11,264	12,266	11,531	11,389	10,458
Barite, run of mine	150,058	120,893	57,373	106,843	119,648
Boron minerals:					
Run of mine	2,554,404	2,398,220	2,357,592	2,214,064	2,207,092
Concentrates	1,504,000	1,402,000	1,493,361	1,346,000	1,400,000
Refined borates	387,000	435,000	420,000 ^e	436,000	436,000
Cement, hydraulic thousand metric tons	34,258	35,825	30,125	32,576	35,077
Clays:					
Bentonite	899,614	636,273	674,178	559,224	831,146
Kaolin	449,954	595,415	574,550	372,344	370,455
Other ^c	6,000,000	6,500,000	2,506,061 ³	2,500,000	2,500,000
Emery	14,535	16,830	13,629	15,418	15,402
Feldspar, run of mine	1,369,655	1,147,716	1,510,293	1,766,387	1,862,310
Fluorspar	4,812	4,113	4,093	5,344	5,000
Glass, crude thousand metric tons	1,203	1,300 ^e	1,400 ^e	1,550 ^e	1,500
Graphite, run of mine ^c	15,000	15,000	15,000	1,393 ^{r,3}	942 ³
Gypsum, other than that for cement	242,960	302,552	328,656	264,038	196,668
Lime ⁹ thousand metric tons	975	914	855	1,310 ^r	1,305
Magnesite, run of mine	1,724,744	2,672,089	1,450,031	3,044,440	3,224,278
Meerscham ^c kilograms	400	500	400	300	200
Nitrogen, N content of ammonia ^c	82,400	53,400	67,100	300,500 ³	289,300 ³
Perlite, run of mine	147,818	149,429	70,738	151,902	136,683
Pumice	950,189	787,081	754,052	820,347	895,616
Pyrites, cupreous, gross weight	896,519	561,565	662,872	952,094	1,103,872
Silica sand, gross weight thousand metric tons	1,211	1,485	1,207	1,274	1,283
Sodium compounds:					
Salt, NaCl, all types do.	2,146	2,126	1,771	2,197	2,243
Soda ash, trona ^c do.	620	620	640	600	600
Sodium sulfate, concentrates	438,069	456,590	300,000 ^e	562,660	556,575
Stone:					
Dolomite	921,105	957,182	915,441	975,971	1,158,539
Limestone, other than for cement thousand metric tons	28,045	30,295	40,572	30,261	28,609
Marble cubic meters	739,240	647,160	460,834	557,630	544,629
Quartzite	2,514,383	2,743,271	2,085,791	2,006,654	2,908,584
Strontium minerals, celestite:					
Run of mine	100,000 ^e	40,000 ^e	110,000 ^e	116,278	116,000 ³
Concentrates	60,540	24,150	63,635	70,000 ^e	70,000
Sulfur: ^c					
S content of pyrites	45,000 ³	26,000 ³	30,000	30,000	30,000
Byproduct:					
Petroleum	47,000	43,000	51,000	48,000 ^{r,3}	48,000 ³
Other	75,000	75,000	75,000	75,000	72,000
Total	167,000	144,000	156,000	155,000	120,000
Talc	48,378	54,278	883	98	--
MINERAL FUELS AND RELATED MATERIALS					
Asphalt, natural ^c	150,000	150,000	150,000	118,235 ³	217,759 ³
Carbon black	26,379	35,144	35,000	35,000	6,754
Coal:					
Hard coal, run of mine thousand metric tons	2,738	3,330	3,370	3,313	3,090
Lignite, run of mine do.	66,706	61,315	58,173	49,627	43,749
Coke and semicoke do.	2,811	2,090	1,890	2,080	2,543
Gas, natural, marketed thousand cubic meters	718,806	611,822	600,000 ^e	268,000 ^e	275,947

See footnotes at end of table.

TABLE 1--Continued
TURKEY: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity		1999	2000	2001	2002	2003 ^p
MINERAL FUELS AND RELATED MATERIALS--Continued						
Petroleum:						
Crude	thousand 42-gallon barrels	21,157	19,783	18,370	17,579	17,000
Refinery products:						
Liquefied petroleum gas	do.	8,071	7,409	8,019	8,580	8,000
Gasoline	do.	38,096	39,889	24,993	31,634	28,800
Naphtha	do.	16,106	15,717	16,656	11,947	11,000
Jet fuel	do.	11,883	11,009	9,496	9,368	13,000
Kerosene	do.	730	638	209	312	5,000
Distillate fuel oil ¹⁰	do.	69,551	70,333	58,901	59,281	54,000
Lubricants	do.	4,501	4,322	1,736	2,090	2,000
Residual fuel oil	do.	9,512	8,769	56,323	53,077	39,000
Asphalt	do.	7,635	7,764	6,661	7,548	8,500
Unspecified ¹¹	do.	1,644	3,110	5,969	6,125	2,600
Total	do.	167,729	168,960	188,963	189,962	171,900

^cEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^pPreliminary. ^rRevised. -- Zero.

¹Table includes data available through September 30, 2004. In addition to the commodities listed, large quantities of construction materials (clay, sand, and gravel) are quarried. Also mined are basalt, diabase, granite, onyx, sandstone, serpentine, slate, and travertine for building stone, limestone and gypsum for cement manufacture, and molybdenum, olivine, titanium, tungsten, and zeolite, but information is inadequate to estimate output.

²Data are for public sector production only. Data for private sector production are not available, but production is believed to be approximately 30,000 metric tons per year.

³Reported figure.

⁴Approximately 70% of gross production is salable product.

⁵Copper mines produce a copper concentrate (of about 22% Cu) and a cupreous pyrite concentrate (of about 0.7% Cu). Copper is not recovered from the cupreous pyrite concentrate.

⁶Data includes estimated content of Turkish copper refinery tankhouse slimes. Prior to 2001, all gold production was the byproduct of base-metals refining.

⁷Does not include manganiferous iron ore from the Deveci Mine, production of which amounts to several hundred thousand tons per year and has a manganese content of 3% to 5%.

⁸Includes estimated content of base-metals-refinery tankhouse slimes.

⁹Data are lime produced for steel production and do not include the widespread artisanal production of lime for whitewash and sanitation purposes.

¹⁰Diesel fuel (gasoil) and special heating oil.

¹¹Includes refinery fuel and losses.